# APPENDIX MM
# TIER 1 – TIER 2 IMPACT COMPARISONS

In an August 31, 2006 letter to INDOT and FHWA, Kenneth Westlake of USEPA Region 5 requested that additional impact information be provided in Tier 2 FEIS documents for this project. He requested, in addition to impacts for that individual section, that each Tier 2 FEIS provide a tally of impacts for all Tier 2 sections. The request asked that this tally include both direct and indirect impacts. This request explicitly assumed that a Tier 2 DEIS would be provided for all sections before any Tier 2 FEIS were provided.

The information in this technical memo is provided to address this request. It is provided in view of the following:

- This FEIS is published in advance of publication of a DEIS in Section 6.
- To satisfy this request, estimates of impacts for all sections are provided using the most recently-published data in a NEPA document. These include:
    - ***Section 1.*** *Final Environmental Impact Statement, October 2007.*
    - ***Section 2.*** *Final Environmental Impact Statement, February 2010.*
    - ***Section 3.*** *Final Environmental Impact Statement, December 2009.*
    - ***Section 4.*** *Final Environmental Impact Statement, July 2011.*
    - ***Section 5.*** *Final Environmental Impact Statement, August 2013.*
    - ***Section 6.*** *Tier 1 Final Environmental Impact Statement*, December 2003 (most impacts); *Tier 1 Revised Biological Opinion (BO),* February 2006 (forest impacts).
- The only published section-level data for Section 6 (other than forest impacts shown in the Revised Tier 1 BO) remains what is published in the Tier 1 FEIS, Table 6-31. This table (and similar tables for Sections 1 – 5) provide section-level impact estimates, and include impacts to the following resources.
    - Total acres of new right-of-way.
    - Acres of farmland impacts.
    - Acres of forest impacts.
    - Acres of wetlands impacts.
    - Acres of floodplain impacts.
    - Residential displacements.
    - Business displacements.

    These are the resources for which impacts are provided in this document.

- Karst impacts are provided in this document for Sections 4 and 5. Karst impacts were published in the Tier 1 FEIS for only a limited number of features (sinking streams and large (over 80 acre) sinkholes. Also, no Tier 1 breakdown of karst impacts was provided by Tier 2 Section. Accordingly, only totals of Tier 2 karst impacts are compared.

- Indirect impacts were not estimated on a section-by-section basis in the Tier 1 FEIS. In addition, estimates of indirect impacts in Section 5 were made for a different forecast year (2035) than for in the case of Sections 1 through 4 (2030). Estimates of indirect impacts have not yet been made for Section 6; these estimates will be available after Tier

2 EISs are published in these sections. For these reasons, the tally of impacts for all Tier 2 sections shows only direct impacts.

Table 1 provides a tally of estimated impacts to these resources for all Tier 2 sections, using the most current data published in a formal NEPA document. Tables 2 through 8 provide breakdowns by Tier 2 section for each of these impact estimates. Table 9 provides a comparison of the karst impacts in Sections 4 and 5. A discussion regarding impacts to each resource follows the table which gives the section-by-section breakdown for impacts to that resource.

**Table 1 - Total Impact Estimates, Compared with Tier 1 FEIS Estimates**

| Impact Category | Tier 1 FEIS Impacts | Updated Impacts | | Change from Tier 1 Estimates | |
|---|---|---|---|---|---|
| | | Low | High | Low | High |
| New Acres of ROW | 5,860 | 6,532 | 6,885 | 672 | 1,025 |
| Farmland Impacts (Acres) | 4,470 | 4,125 | 4.230 | (345) | (240) |
| Forest Impacts (Acres) | 1,150 | 1,670 | 1,885 | 520 | 735 |
| Wetland Impacts (Acres) | 75 | 43 | 48 | (32) | (27) |
| Floodplain Impacts (Acres) | 830 | 417 | 432 | (413) | (398) |
| Residential Impacts | 390 | 418 | 422 | 28 | 32 |
| Business Impacts | 76 | 77 | 77 | 1 | 1 |

| Table 2 - New Acres of Right-of-Way Impacts, Compared with Tier 1 FEIS Estimates | | | | | | |
|---|---|---|---|---|---|---|
| | | | Updated Impacts | | Change from Tier 1 Estimates | |
| Section | Source of Updated Impacts | Tier 1 FEIS Impacts | Low | High | Low | High |
| 1 | Tier 2 Final EIS, Table 5.3-1 | 550 | 720 | 720 | 170 | 170 |
| 2 | Tier 2 Final EIS, Table 5.3-1 | 1,300 | 1,702 | 1,702 | 402 | 402 |
| 3 | Tier 2 Final EIS, Table 5.2-2 | 1,100 | 1,722 | 1,722 | 622 | 622 |
| 4 | Tier 2 Final EIS, Table 5.3-1 | 1,560 | 1,456 | 1,809 | (104) | 249 |
| 5 | Tier 2 Final EIS, Table 5.3-1 | 585 | 327 | 327 | (258) | (258) |
| 6 | Tier 1 Final EIS, Table 6-31 | 605 | 605 | 605 | 0 | 0 |
| | Total | 5,700 | 6,532 | 6,885 | 832 | 1,185 |

Right-of-way impacts are on average 18% higher in Tier 1. The primary reason is that right-of-way associated with access roads is outside of the typical section for the mainline alternative. In Tier 1, access roads were assumed in some locations, but only as part of the typical section of the I-69 mainline. In Tier 2, detailed impact and engineering studies have identified many locations where local access roads separate from the mainline typical section are needed. Such locations would not have been identified in any Tier 1 alternative selected for Tier 2 studies.

Local access roads are used to provide a roadway entrance to properties whose existing access would be removed as part of I-69 project. If such access were not provided, such properties typically would need to be acquired by INDOT, further increasing the cost and impacts of the project.

In Tier 1, the footprint associated with each interchange was assumed to be 10 acres outside of the mainline right-of-way. This was consistent with a typical rural diamond interchange whose ramps are separated by approximately 800 feet (e.g., the northbound exit and southbound entrance ramps are 800 feet apart). In Tier 2 studies, INDOT directed that many interchanges be larger, with ramp spacing increased by 50% (to 1,200 feet). This would allow for future "loop" ramps to be built, should traffic increases in future years require them. This increases the acres of right-of-way required for interchanges. Also, some interchanges (such as the North Pike and South Daviess interchanges in Section 2, and the County Line Interchange in Section 4) have lengthy access roads to connect to the local highway system; these also require added right-of-way.

In addition, INDOT has determined that both Sections 3 and 6 would each have a rest area. However, neither the Tier 1 estimates for Section 3 nor Section 6 include the impacts for this rest area. The impacts associated with rest areas are included in the Section 3 Tier 2 estimates; they are not yet show in the Section 6 Tier 2 estimates. These impacts were not allocated to specific Tier 2 sections in the Tier 1 FEIS estimates, and are not included in Table 2's Tier 1 FEIS impacts.

Right-of-way impacts in Section 5 in both Tier 1 and Tier 2 include only that right-of-way outside of the existing SR 37 right-of-way. Engineering efforts in Section 5 Tier 2 emphasized the reuse of the existing SR 37 right-of-way and pavement. This resulted in significant decreases in Tier 2 right-of-way impacts, as well as decreases in most resource impacts, as compared with Tier 1 estimates in Section 5.

| Table 3 - Acres of Farmland Impacts, Compared with Tier 1 FEIS Estimates | | | | | | |
|---|---|---|---|---|---|---|
| | | | Updated Impacts | | Change from Tier 1 Estimates | |
| Section | Source of Updated Impacts | Tier 1 FEIS Impacts | Low | High | Low | High |
| 1 | Tier 2 Final EIS, Table 5.3-1 | 540 | 630 | 630 | 90 | 90 |
| 2 | Tier 2 Final EIS, Table 5.3-1 | 1,180 | 1,113 | 1,113 | (67) | (67) |
| 3 | Tier 2 Final EIS, Table 5.4-7 | 1,070 | 1,501 | 1,501 | 431 | 431 |
| 4 | Tier 2 Final EIS, Table 5.4-7 | 670 | 356 | 461 | (314) | (209) |
| 5 | Tier 2 Final EIS, Table 5.4-6 | 385 | 60 | 60 | (325) | (325) |
| 6 | Tier 1 Final EIS, Table 6-31 | 465 | 465 | 465 | 0 | 0 |
| | Total | 4,310 | 4,125 | 4,230 | (185) | (80) |

Farmland impacts are somewhat less (3%, on average) than those published in the Tier 1 FEIS. In Section 3, farmland impacts are considerably higher than the Tier 1 estimates, due to the addition of numerous access roads not assumed in the Tier 1 study, as well as the inclusion of a rest area in Section 3, which was not included in the Tier 1 estimate for Section 3. These are offset by the impacts in Section 4 and Section 5, where farmland impacts are much less than those shown in the Tier 1 FEIS.

As noted in the previous section, INDOT has determined that both Sections 3 and 6 will each have a rest area. The impacts associated with rest areas were included in the project-wide farmland impact estimates shown in Table 1. The impacts associated with rest areas include a significant amount of farmland. The impacts associated with rest areas are included in the Section 3 Tier 2 estimates; they are not yet show in the Section 6 Tier 2 estimates. Farmland impacts attributable to rest areas were not allocated to specific Tier 2 sections in the Tier 1 FEIS estimates, and are not included in Table 3's Tier 1 FEIS impacts.

Engineering efforts in Section 5 Tier 2 emphasized the reuse of the existing SR 37 right-of-way and pavement. This resulted in Tier 2 farmland impacts in Section 5 which were only 16% of those estimated in Tier 1.

| Table 4 - Acres of Forest Impacts, Compared with Tier 1 FEIS Estimates | | | | | | |
|---|---|---|---|---|---|---|
| | | | Updated Impacts | | Change from Tier 1 Estimates | |
| Section | Source of Updated Impacts | Tier 1 FEIS Impacts | Low | High | Low | High |
| 1 | Tier 2 Final EIS, Table 5.20-2 | 10 | 27 | 27 | 17 | 17 |
| 2 | Tier 2 Final EIS, Table 5.20-5 | 100 | 210 | 210 | 110 | 110 |
| 3 | Tier 2 Final EIS, Table 5.20-3 | 30 | 67 | 67 | 37 | 37 |
| 4 | Tier 2 Final EIS, Table 5.20-6 | 890 | 872 | 1,087 | (18) | 197 |
| 5 | Tier 2 Final EIS, Table 5.20-7 | 90 | 228 | 228 | 138 | 138 |
| 6 | Revised Tier 1 Biological Opinion, Table 3 | 30 | 266 | 266 | 236 | 236 |
| | Total | 1,150 | 1,670 | 1,885 | 520 | 735 |

Forest impacts are trending upward from those shown in the Tier 1 FEIS. The largest upward trends are observed in Sections 2, 5, 6 and perhaps Section 4. As may be seen by comparison with Tables 4 and 5, these upward trends in forest impacts are matched in Sections 2, 4 and 5 with downward trends in farmland impacts. This suggests that some land identified in Tier 1 studies as farmland now is being identified as forested. Part of this is due to the more precise data available in Tier 2 studies for identifying forest.

The Tier 1 forest data used for comparing corridors was the best available data showing forest cover within the 26-county Tier 1 study area, and was suitable for comparing forest impacts for alternative corridors. It was provided by the United States Geological Survey, and is a subset of its National Land Cover Data set. It was derived by remote sensing photointerpretation techniques using satellite photography, with a nominal 30-meter (approximately 100 foot) resolution. The nominal date for this data was 1992.

The estimates for forest impacts in the Tier 2 studies are based upon field surveys and aerial photographs taken in various years between 2003 – 2011. These identified forested areas that may not have been identified in the dataset used in Tier 1, and on more precise delineation of forest size. Forests are identified using United States Department of Agriculture (USDA) definitions.

The greater forest impacts in Tier 2 may be attributable to two factors. First, smaller forested areas which were not identifiable from the USGS data set now are being identified by on-the-ground field surveys. Second, in some sections (particularly Sections 2 and 5) access roads outside of the mainline typical section tend to be located in forested areas.

| Table 5 - Acres of Wetlands Impacts, Compared with Tier 1 FEIS Estimates | | | | | | |
|---|---|---|---|---|---|---|
| | | | Updated Impacts | | Change from Tier 1 Estimates | |
| Section | Source of Updated Impacts | Tier 1 FEIS Impacts | Low | High | Low | High |
| 1 | Tier 2 Draft EIS, Table 5.19-14 | 5 | 1 | 1 | (4) | (4) |
| 2 | Tier 2 Final EIS, Table 5.19-13 | 35 | 24 | 24 | (11) | (11) |
| 3 | Tier 2 Final EIS, Table 5.19-11 | 5 | 5 | 5 | 0 | 0 |
| 4 | Tier 2 Final EIS, Table 5.19-12 | 20 | 5 | 10 | (15) | (10) |
| 5 | Tier 2 Final EIS, Table 5.19-18 | 5 | 3 | 3 | (2) | (2) |
| 6 | Tier 1 Final EIS, Table 6-31 | 5 | 5 | 5 | 0 | 0 |
| | Total | 75 | 43 | 48 | (32) | (27) |

Estimates of wetlands impacts are trending down from Tier 1 estimates. Current Tier 2 estimates show wetland impacts which are on average 61% for those identified in Tier 1. Tier 1 identified wetlands using National Wetland Inventory (NWI) mapping; data were not field-verified. In Tier 2, wetland identification relied on field studies; by the time that the FEIS is published in each section, all wetland impacts for the preferred alternative are based upon field delineations in consultation with US Army Corps of Engineers. In addition, avoiding impacts to wetlands and other important water-quality resources is a significant consideration in determining Tier 2 preferred alternatives.

Tier 2 EISs show that 2 acres of forested wetlands are impacted in Section 2, 1 acre is impacted in Section 3, 2 acres are impacted in Section 4, and 1 acre is impacted in Section 5. The forested wetlands impacted in Section 1 are negligible. Forested wetlands in Sections 2 through 5 are shown in Table 5 (Wetland Impacts). These are excluded from Table 4 (Forest Impacts) to avoid double-counting.

Tier 1 showed approximately one-half of the potential wetlands impacts for the entire project in Section 2. Significant efforts were made in Section 2 to minimize water quality impacts for its preferred alternative. The Section 2 FEIS showed over a 30% reduction in wetland impacts from those estimated in the Tier 1 FEIS.

| Table 6 - Acres of Floodplain Impacts, Compared with Tier 1 FEIS Estimates | | | | | | |
|---|---|---|---|---|---|---|
| | | | Updated Impacts | | Change from Tier 1 Estimates | |
| Section | Source of Updated Impacts | Tier 1 FEIS Impacts | Low | High | Low | High |
| 1 | Tier 2 Draft EIS, Table 5.19-14 | 30 | 36 | 36 | 6 | 6 |
| 2 | Tier 2 Final EIS, Table 5.19-13 | 420 | 166 | 166 | (254) | (254) |
| 3 | Tier 2 Final EIS, Table 5.19-11 | 65 | 19 | 19 | (46) | (46) |
| 4 | Tier 2 Final EIS, Table 5.19-12 | 130 | 36 | 51 | (94) | (79) |
| 5 | Tier 2 Final EIS, Table 5.19-18 | 100 | 75 | 75 | (25) | (25) |
| 6 | Tier 1 Final EIS, Table 6-31 | 85 | 85 | 85 | 0 | 0 |
| | Total | 830 | 417 | 432 | (413) | (398) |

Tier 2 estimated floodplain impacts are consistently smaller than those estimated in Tier 1. In Tier 1, floodplain impacts were estimated by digitizing data from a figure in “The Indiana Water Resource Availability, Uses and Needs" (1980). This data is very general. This was the best available source for use in Tier 1 to identify and compare floodplain impacts across a 26-county study area.

In Tier 2, floodplains are identified using county-level mapping from the Digital Flood Rate Insurance Maps (DFIRM) (dated 2004 through 2010). These data shows floodplains identified by Federal Emergency Management Agency (FEMA) Flood Rate Insurance Maps (FIRM). The FIRM is the basis for floodplain management, mitigation, and insurance activities for the National Flood Insurance Program (NFIP). In addition, more detailed Tier 2 engineering studies avoided floodplains as part of overall avoidance of water resource impacts. For example, the reduction in floodplain impacts are more pronounced in Sections 2 through 4 (which are on new alignment) than in Section 5 (for which the alignment is constrained to use the right-of-way of existing SR 37).

The significantly lower floodplain impacts in Tier 2 are due to a combination of Tier 2 avoidance activities, as well as use of more precise floodplain data. It should be noted the most land shown as floodplain also would be classified as farmland or forested land.

| Table 7 - Number of Residential Displacements, Compared with Tier 1 FEIS Estimates | | | | | | |
|---|---|---|---|---|---|---|
| | | | Updated Impacts | | Change from Tier 1 Estimates | |
| Section | Source of Updated Impacts | Tier 1 FEIS Impacts | Low | High | Low | High |
| 1 | Tier 2 Final EIS, Table 5.2-3 | 24 | 18 | 18 | (6) | (6) |
| 2 | Tier 2 Final EIS, Table 5.2-4 | 37 | 65 | 65 | 28 | 28 |
| 3 | Tier 2 Final EIS, Table 5.2-2 | 23 | 18 | 18 | (5) | (5) |
| 4 | Tier 2 Final EIS, Table 5.2-2 | 33 | 71 | 75 | 38 | 42 |
| 5 | Tier 2 Final EIS, Table 5.2-5 | 146 | 119 | 119 | (27) | (27) |
| 6 | Tier 1 Final EIS, Table 6-31 | 127 | 127 | 127 | 0 | 0 |
| | Total | 390 | 418 | 422 | 28 | 32 |

Tier 2 estimates of residential displacements are slightly higher (8% on average) higher than those estimated in the Tier 1 FEIS. They are noticeably higher in Section 2 and Section 4; they are lower in other sections. In Section 5, displacements are only 82% of Tier 1 estimates; this is in part due to the emphasis on reusing the existing SR 37 right-of-way and pavement for the Section 5 preferred alternative.

| Table 8 - Number of Business Displacements, Compared with Tier 1 FEIS Estimates | | | | | | |
|---|---|---|---|---|---|---|
| | | | Updated Impacts | | Change from Tier 1 Estimates | |
| Section | Source of Updated Impacts | Tier 1 FEIS Impacts | Low | High | Low | High |
| 1 | Tier 2 Final EIS, Table 5.2-3 | 2 | 2 | 2 | 0 | 0 |
| 2 | Tier 2 Revised Draft EIS, Table 5.2-4 | 1 | 2 | 2 | 1 | 1 |
| 3 | Tier 2 Final EIS, Table 5.2-2 | 0 | 1 | 1 | 1 | 1 |
| 4 | Tier 2 Final EIS, Table 5.2-2 | 1 | 4 | 4 | 3 | 3 |
| 5 | Tier 2 Final EIS, Table 5.2-5 | 22 | 18 | 18 | (4) | (4) |
| 6 | Tier 1 Final EIS, Table 6-31 | 50 | 50 | 50 | 0 | 0 |
| | Total | 76 | 77 | 77 | 1 | 1 |

Business displacements are virtually unchanged since Tier 1 estimates. Business displacements are minimal for new alignment sections of I-69. The Tier 1 FEIS estimated a total of 4 impacts in the first four sections, and Tier 2 estimates show 9 business displacements. Section 5's estimates of business displacements are slightly less those estimated in Tier 1. This is in part due to the emphasis on reusing the existing SR 37 right-of-way and pavement for the Section 5 preferred alternative. In Section 5, there is one institutional displacement which is included under business displacements.

| Table 9 - Number of Karst Impacts | | | | |
|---|---|---|---|---|
| | | Tier 1 FEIS Impacts (number) | Number of Karst Features[1] | |
| Section | Source of Updated Impacts | | Low | High |
| 4 | Tier 2 Final EIS, Table 5.21-3 | | 88 | 108 |
| 5 | Tier 2 Final EIS, Table 5.21-4 | | 110 | 110 |
| | Total | 50 | 198 | 218 |

In Tier 1, karst impacts were not broken down by Tier 2 Section. In addition, karst impacts were estimated for all alternatives within the 26-county Tier 1 Study Area using the best available data source for karst features within the entire Study Area. This source documented larger sinkhole areas, as well as sinking stream basins. It was provided by the Indiana Geological Survey, and was created in a systematic manner so that each county in the study area was mapped in a similar fashion. See Tier 1 FEIS, pp. 5-236 to 5-241 for more details. It was known that additional features would be identified in more detailed Tier 2 studies.

Tier 2 studies identified features which were not included in the Tier 1 karst data. These included all sinkholes, swallets (the area where a stream sinks into the subsurface or the opening at the bottom of a sinkhole), caves, and springs.